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Teaching with CLASS: Creating Laboratory Access for Science Students with Disabilities

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Scientists love a good problem. Curious and persistent by nature, scientists will admire a problem and tease it until the original enigma becomes another building block in the ever-growing complex of understanding. This propensity toward problem solving is what led a group of scientists at Wright State University (WSU) to develop an innovative program named CLASS (i.e., Creating Laboratory Access for Science Students).

Program Context

CLASS uses intensive summer workshops to train practicing teachers (grades 7-university). The focus is on how to make laboratory and field experiences accessible to all students, including those with significant disabilities.

Rationale for the Program

The inception of the CLASS Project began several years ago, as biology faculty struggled to meet the needs of a significant

number of WSU undergraduates with disabilities enrolled in required laboratory science classes. The problem faculty faced was how to adapt “traditional” science labs and field experiences so students with significant physical or sensory disabilities could actively engage in their own learning. How could a young woman using a wheelchair examine slides under stationary microscopes? How could a student with limited hand movement manipulate glass beakers safely?

Seeking input from students, professors began to experiment with accommodations in their general education labs. For example, they installed a special, weighted base that allows a microscope to “float” off the edge of the bench, making it possible for a student who uses a wheelchair to reach the eye piece. Plastic beakers replace glass ones. Models (purchased and constructed) permitted students with visual impairments to explore materials with their hands. As a result of these initial efforts, over 70 WSU students with significant physical disabilities have successfully completed course requirements in biology, and several have pursued science careers.

Sponsoring Agency

In 1996, Michele Wheatly, current Dean of the College of Science and Mathematics (COSM) at Wright State University, recognized the need to expand her faculty's work

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to other educational environments, and applied for funding through the National Science Foundation (NSF). Resources from two successive NSF grants totaling almost one million dollars are now used by the CLASS Project to address their long-term goal of increasing the percentage of people with disabilities represented in science careers by providing intensive inservice to science educators and special educators (National Science Foundation, 1998).

The Innovative Model

The original biology professors have been joined in their efforts by other COSM faculty and staff as well as similarly dedicated individuals from the College of Education and Human Services (CEHS) and the Office of Disability Services (ODS). Together, this team designs and delivers an annual two-week summer workshop to practicing science and special education teachers from all over the United States. This workshop offers a two-fold benefit: practical instruction is grounded in research; and teachers have an immediate opportunity to implement new learning with actual students who have disabilities. The unique aim of the CLASS Project during these intensive training sessions is to facilitate excellence in science education while teaching educators who need help meeting the physical and learning needs of their science students with disabilities, particularly in laboratory and field-based settings.

Program Features

CLASS participants have been a diverse group. They have experienced a wide variety of innovative initiatives in varied settings.

Program Participants

Each summer the WSU hosts an average of 15 educators from all over the United States. The CLASS Project pays all travel expenses and provides graduate credit as well as a stipend. Teachers (grades 7-university) are recruited from professional conferences (Council for Exceptional Children, National Science Teachers Association, etc) and mailings to school districts and resource centers.

Selection is based on a written application addressing level of interest in science and disability, a description of current need, and a commitment to inclusive learning communities. Preference is given to science/special education teams from the same school.

Program Components

Consistent with National Science Education Standards, all CLASS initiatives focus on inclusion, technology, inquiry, and innovation. Each Workshop lab is taught by a WSU scientist and supported by special education faculty and/or a Disability Services Specialist. Physical accommodations, adaptive equipment, and assistive technology allow teachers and students with disabilities to "touch the science." For example, virtual labs enable students who have extremely limited mobility an opportunity to manipulate and explore their environments. Accommodations notwithstanding, however, adherents to the CLASS philosophy primarily employ teaching and assessment techniques based on universal design (Stefanich, 2001, p. 147). CLASS teaches that proactive planning by conscientious teachers often negates the need for complex modifications, and thereby makes the inclusion process that much easier.

Through inquiry-based learning CLASS maintains a hands-on/minds-on learning environment (Olson & Loucks-Horsley, 2000). Within this framework, students' previous experiences, knowledge, and interests are clearly respected. Flexible cooperative group learning opportunities, student choice making, and structure through ongoing teacher facilitation and collaboration are other fundamental components of the CLASS Project.

Program Delivery

During the first week of the Workshop, faculty use the CLASS Project Laboratory Manual (Wood, 2001a) and Sourcebook (Wood, 2001b) to teach participants about disabilities, adaptive technology, and laboratory/field teaching techniques that reflect National Science Education Standards (Olson & Loucks-Horsley, 2000). In week two middle and high school students with a wide range of significant disabilities join the teacher participants. Students and educators en-

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gage in multiple, hands-on, inquiry-based laboratory and field exercises, with the students teaching the educators how to best meet their individual learning needs. Following the sessions, adult participants meet with CLASS science and special education faculty to reflect and debrief. Before the end of the Workshop, teachers also develop a detailed action plan specific to their home school. Contact and support is maintained following the Workshop through the CLASS Project Web page, electronic mail, telephone, mini-grants, and potential follow-up inservices in the teachers' home schools.

Outcome Data

Program productivity, participant satisfaction, and overall impact have been evaluated for the CLASS project. In general, outcomes have been favorable.

Program Productivity

To date, the CLASS Project team has conducted six summer workshops, training more than 50 teachers from places as widespread as California, New York, and Great Britain.

Participant Satisfaction Data

Teachers maintain a reflective journal throughout their two-week stay and provide feedback following each laboratory or field experience. While teachers sometimes express frustration or anxiety, particularly early on, their comments invariably indicate invaluable learning. For example, one teacher wrote:

Today I spent time with Ryan. Although he still communicated with an eye-gaze board—facial expressions and body movements spoke volumes. I was a little nervous in the beginning but soon relaxed after I realized I could treat him like a normal kid!

Teachers in the CLASS Workshop develop relationships that often result in renewed commitment to students. A participant from the Summer 2003 Workshop echoed the feeling of many:

Caring about students will help us press toward the mark of promoting student success despite our differences of opin-

ion. After all, the twinkle in a student's eye when he connects with a concept is reason enough for us to lay aside our differences and keep the focus on our students. May God grant me the strength to live that ideal.

Program Impact Data

Workshop participants complete pre- and post-test 5-point (1 = low, 5 = high) Likert-type scale questionnaires designed to assess their preparedness to teach science to students with disabilities. Ninety percent of participants reported little or no pre-service preparation on how to serve students with disabilities in science laboratories. Before the workshop, teachers' mean responses ranged from 1.95 to 2.95 in preparedness areas such as management strategies, addressing students' needs, research on best practices, and knowledge of resources in teaching science to students with disabilities. Post-workshop preparedness responses ranged from 3.30 to 4.00. The greatest gains were in the areas of resources and management strategies (gains of 1.90 and 1.50 respectively), particularly for teaching students with orthopedic, sensory, or multiple disabilities.

Qualitative data also support the long-term effectiveness of the CLASS Project Workshop. Follow-up teacher reports indicate success in teaching students who are blind, in writing addenda focusing on disability to school district courses of study, and in obtaining administrator support for inclusion on a school-wide basis.

Discussion and Recommendations

Formal preparation of science teachers has not kept pace with changing legislation that mandates access of students with disabilities to general education curriculum. The CLASS Project addresses this problem through comprehensive summer workshops for practicing teachers.

The CLASS Project continues to grow. The ultimate goal is to disseminate CLASS Project philosophy and techniques on a national level. Staff is currently developing an online course that will be available to preservice and inservice teachers all over the United States. Teacher mini-grants, outreach pro-

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grams, and continuing research into the nature of science teaching and learning for students with disabilities are other efforts underway as the CLASS Project matures.

Implications for the Field

As educational reform efforts focus more on outcomes for all, students with disabilities and their teachers may find themselves under an unexpected spotlight. Projects like CLASS will be invaluable as teachers and students work together to match learning needs and strengths with effective methodology and assessment. The end result will be mastery of content standards, a love of science, and unlimited possibility for the future.

Contact Information

To obtain additional information about the CLASS Project or to receive a free copy of the CLASS Sourcebook CD, please contact Mary Ellen Bargerhuff, at 347 Allyn

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